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Science Standard
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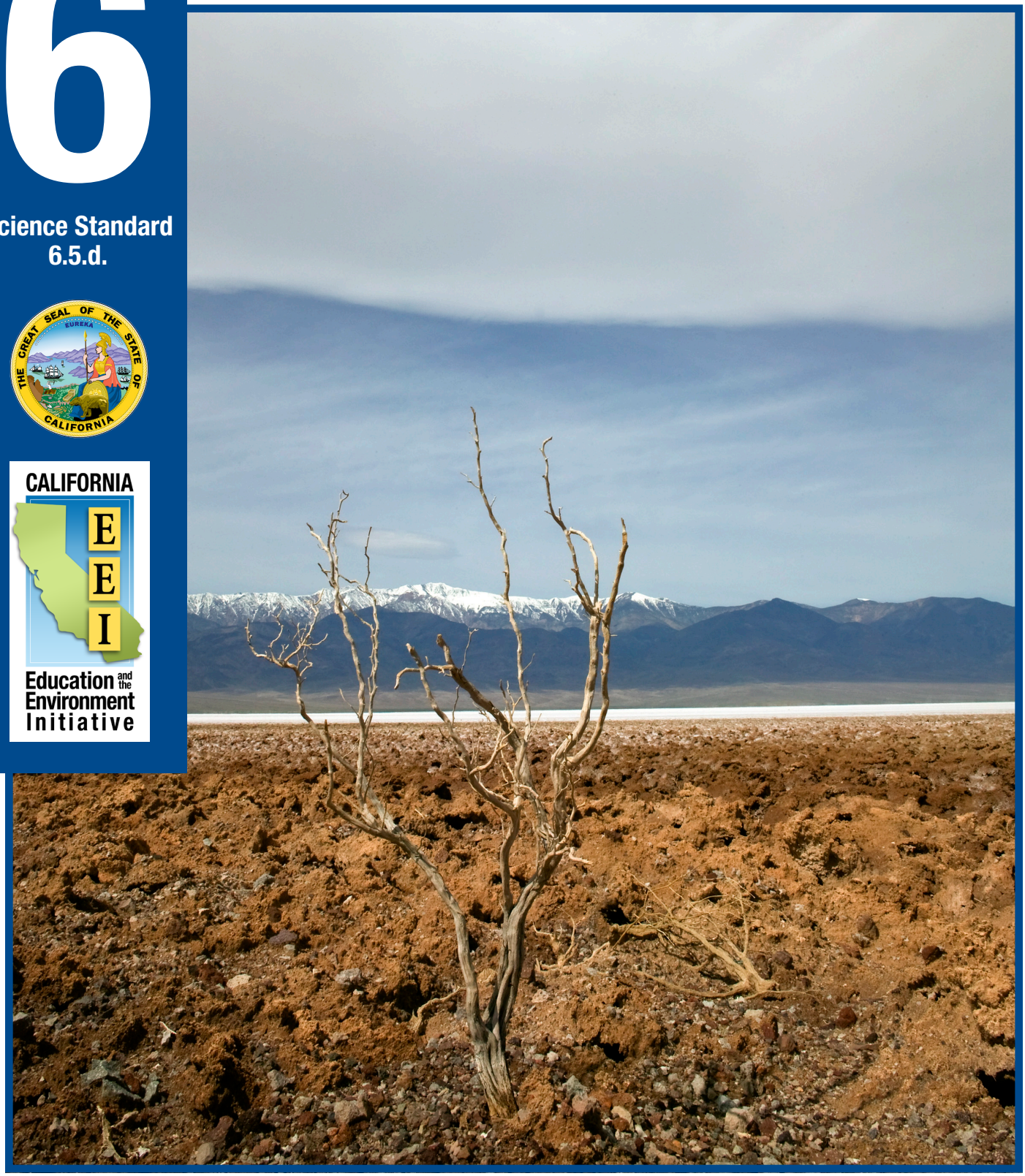
Student Edition

California Education and the Environment Initiative



Playing the Same Role

California Education and the Environment Initiative

Approved by the California State Board of Education, 2010

The Education and the Environment Curriculum is a cooperative endeavor of the following entities:

California Environmental Protection Agency

California Natural Resources Agency

Office of the Secretary of Education

California State Board of Education

California Department of Education

California Integrated Waste Management Board

Key Leadership for the Education and Environment Initiative:

Linda Adams, Secretary, California Environmental Protection Agency

Patty Zwarts, Deputy Secretary for Policy and Legislation, California Environmental Protection Agency

Andrea Lewis, Assistant Secretary for Education and Quality Programs, California Environmental Protection Agency

Mark Leary, Executive Director, California Integrated Waste Management Board

Mindy Fox, Director, Office of Education and the Environment, California Integrated Waste Management Board

Key Partners:

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Office of Education and the Environment

1001 I Street • Sacramento, California 95812 • (916) 341-6769

http://www.calepa.ca.gov/Education/EEI/

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A Pig's Tale

Emily awakened at 5 AM on the day of the show at the county fair. The weather was going to be hot—95 degrees in the valley—and she wanted to make sure that Leonard stayed comfortable. Placing her feet on the cool plank floor, she thought about the exciting day ahead.

Emily pulled on her boots without bothering with socks, grabbed a brush and pail, and stumbled out to the barn to give Leonard a bath.

Running her fingers along the smooth edge of Leonard's stall in the dark, she found the light switch and flipped it on. To her surprise, the latch on the gate was up. The gate had been pushed open, and now sagged on bent hinges. Leonard was nowhere to be found!

Emily stepped back into the yard and listened. Her heart thumped in her chest. Could a predator have gotten in to Leonard's stall last night? Suddenly, she heard a grunt in the direction of the compost pile. As her eyes adjusted to the early morning light, Emily could see Leonard, his 300-pound body rooting around in the rotting vegetables and fruits.

Feral pig

"Leonard," Emily said softly, not wanting to frighten her massive pet pig. "The judges should crown you king of garbage, instead of giving you first place!"

Domestic Pigs

Leonard is a domestic pig. He has a body shaped like a barrel, and long snout that ends in a round disk. When pigs are hungry, they put their heads down and bury their snouts in the dirt. Then they bring their heads up quickly, rooting out food underground. Pigs are omnivores. This means that they eat both plants and animals. Pigs in the wild live on leaves, roots, fruit, vegetables, reptiles, and

Australian savanna

rodents. Domestic pigs—like Leonard—are usually fed corn, grain, roots, dairy byproducts, and compostable garbage. Leonard weighs about 300 pounds, but his relatives can easily reach 700 pounds and more. Some domestic pigs have been known to weigh as much as 2,000 pounds!

Pigs have thick skin covered with a coat of stiff hairs called "bristles." These hairs poke all the way through the pig's hide, making pigskin a comfortable leather to wear because it naturally "breathes." Bristles are sometimes used to make cleaning and hair brushes. Pigs have both upper and lower tusks, which are really teeth that keep growing throughout their lives. They sharpen their tusks by rubbing them together when they eat.

Male pigs are known as "boars" and female pigs are called "sows." Baby pigs are called "piglets," and after they are weaned from their mother they are called "shoats." Intelligence tests have shown that pigs are the smartest of all domesticated animals—even dogs. Pigs also have a keen sense of smell, which they often use to find food. People in France and other countries use pigs to search for truffles—a rare and expensive fungus (like a mushroom)—that grows underground.

Despite what you may have heard, pigs are not normally dirty. Because they do not sweat like humans do, rolling around (wallowing) in shallow mud holes allows them to stay cool during hot summer months. If kept in a cool environment, they stay very clean. Many people keep pigs as pets and sleep with them to keep warm. Pigs can be house-trained and can make great pets.

Pigs belong to a group of mammals that first appeared on Earth about 46,000 years ago. Camels and hippos are part of this group; so are cattle, sheep, and goats. Over thousands of years, pigs developed complex digestive systems, which allow them to eat almost any kind of food. Pigs have survived many changes on Earth because they were able to change their diet as the environment around them changed.

How People Use Pigs

Humans began to use pigs for food (meat) and clothing (leather) about 6,900 to 12,000 years ago. Archaeologists believe pigs originated in West Asia, and were taken to every continent except Antarctica. Pigs were first brought to Hawaii around 1,000 CE. They even traveled with Christopher Columbus on his second voyage to the Americas in 1493. The colonists loved pigs because they could reproduce very fast, would eat anything, and were a cheap source of food. They brought them to the eastern coast of North America in the early sixteenth century. People dropped off pairs of pigs on the tiny islands off the coast, to be captured later and used. They called these "hog" islands. When they returned, the islands were teeming with pigs!

Pigs came to California with Spanish settlers in the 1700s. The pigs enjoyed living under the giant oaks, dining on the many acorns that fell from the trees in the fall. Acorns provided free food for the pigs, while the ranchers and their families enjoyed as much bacon and pork as they could eat.

Arrival of Wild Pigs

In the 1920s, a hunter named George Gordon Moore brought several wild pigs from Germany to North Carolina. He and his friends hunted the wild animals on his game preserve. Moore

Wild pig and piglets

decided to bring some of the strongest wild boars and sows to his ranch in California. These wild pigs were not only strong; they were smart, and eventually escaped from the California ranch to share the oak woodlands and acorns with their relatives, the domestic pigs. Soon, California was home to a new breed of "feral" pigs. These wild hogs still roam the chaparral-covered hills of our state.

Pig rooting

They are both a resource (for hunters) and a pest, because their rooting causes damage to natural systems.

Able to Adapt

Throughout history, wherever pigs were taken, they made themselves at home. Because they adapted so well to different environments, pigs have always been a valued resource for humans. Pigs—domestic and wild—thrive across most biomes, on all continents except Antarctica, where it is difficult for them to find food. Today, there are over 370 breeds of pigs on Earth. They come in all colors, from the pure Chester White, to the black and white Hampshire, and the deep red Durok. People use some breeds only for specific products—like bacon. Other breeds have other uses, including becoming treasured pets like Emily's Leonard.

Emily gently pulled Leonard away from the compost pile. The Sun was coming up, and she could see her parents making coffee in the kitchen. She guided Leonard back to the barn by tapping him lightly on his back. In the barn, she washed the vegetables off of his face and neck. Then she scrubbed his coat with a soft brush and shampoo. Leonard was patient. He stood quietly while Emily dried him off with a towel and carefully brushed his bristles back and down. He was a prize-winning pig, after all, and knew the compost pile was not going anywhere. It would still be there when he returned later that day from the county fair with a shiny, blue, first-place ribbon.

Case 1: Goats and Grass in California

Goats love grass. And shrubs and weeds. They are herbivores that naturally graze on grasses and other vegetation. People throughout California are taking advantage of this and using goats to control vegetation.

There are about 6,000 wildfires per year in California. While the fires are often driven by dry Santa Ana winds, they are fueled by dry grasses and brush. Cities, like Oakland, have hired herds of goats to graze on hillsides in order to reduce the risks of fires.

Farmers have brought in goats to clear land for planting, and to keep weeds in control between harvests. Goats have also been used to clear irrigation ditches so water flows freely. The city of Sunnyvale hired goats to maintain their landfills. The pipes and wells in the landfill were hard for tractors to get around. There was also a risk of sparks from the vehicles starting a fire.

The herds of goats that do this work are not wild. They are owned by ranchers who bring them to a job site just long enough to graze their way through a specific area. They are herded by livestock guardian dogs or fenced in to keep them from escaping into areas where they do not belong.

Case 2: Cane Toads in Australia

In 1935, sugarcane crops in Australia were at risk. Beetles and grubs were destroying the crops, and farmers were upset. Scientists suggested bringing in cane toads, which are native to Central and South America, to kill off the beetles. Like most frogs, cane toads eat small animals, including insects. So cane toads were introduced to Australia to save the sugarcane.

However, the cane toads found many other foods to eat in their new environment. They did not go after the beetles. The beetles could fly, and were not the easiest prey for the frogs to catch.

The cane toads were very well-suited to their new surroundings. They reproduce very quickly, so their numbers increased quickly. In addition, they give off a poisonous fluid when they are attacked, killing most of the predators that try to eat them. In their native lands, there are many predators that can tolerate the cane toad's poison. But in Australia, the toads have no predators.

The toads have spread over much of Australia. They live in open grasslands and open woodlands, two ecosystems that are common throughout the country. Cane toads compete successfully with many native species. They are omnivores and will eat a wide variety of foods. They have had a major effect on wildlife in Australia.

Over time, some Austrailian species have learned to eat the cane toad without getting poisoned. This has helped slow the spread of the toads into some areas. However, the toads are also adapting to a wider range of conditions, and may spread into new habitats in the future.

Case 3: Eucalyptus Trees in California

There are eucalyptus trees growing all over California. But before the Gold Rush of 1849, there were no eucalyptus trees here. They were brought to California to solve a problem.

In the early 1850s, many people moved to California to search for gold. They came to Sacramento and San Francisco, which were then small settlements. Towns grew quickly throughout the Sierra foothills. These areas were surrounded by oak woodlands and grasslands. There were no large forests around.

As the towns began to grow, the need for timber and wood products grew. People needed wood for housing and sidewalks. They needed wood for fuel for heating, cooking, and steam production. They needed wood to build wagons, carriages, mining structures, and many more items. Almost everything was made of wood! Native forests near the towns could not supply enough wood.

Californians learned of a great Australian tree that grew quickly in climates like ours. It seemed like a perfect solution to the lack of wood. The first eucalyptus seeds were planted in 1853. By the 1870s, the fast-growing tree was planted on thousands of acres. The trees were planted for use in shipbuilding, as fuel, and to build railroad ties. People even thought the trees could prevent malaria.

California's young trees, however, did not produce the same quality timber as Australia's old-growth eucalyptus trees. The wood split and curled, and did not work the way people expected. The state was left with thousands of acres of eucalyptus trees that could not be used as planned.

Today, many people enjoy California's eucalyptus groves. They serve as windbreaks for highways, orange groves, and other farms. They are also attractive shade trees in cities and gardens. Other people, however, express strong concern about the trees because they compete with native trees, consume a lot of water, and do not support native animals or the growth of nearby native plants. In some places, eucalyptus trees are being removed and native trees and plants are being planted in their place.

Case 4: Honey Bees in Brazil

In 1956, scientists in Brazil wanted to develop a honey bee that was better adapted to the South American tropics. They wanted the bees to produce more honey. They brought some queen bees from Africa to mate with the bees in Brazil. (Those bees came from Europe, where the climate was colder.)

African bees have some different characteristics than the European bees. Beekeepers have bred European bees over thousands of years in some places. They have created a calmer, gentler breed of bees. In Africa, however, beekeeping is not common. The bees live in the wild and must defend themselves from predators. They are more aggressive than the bees in North and South America.

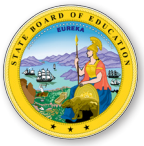
African bees are more likely to attack intruders. They protect a larger area around their hives. There are also more guard bees within the hive. African bees are also more likely to migrate to a new area if food supplies are low. They swarm and look for new homes more often as well. They are not very picky about where they build their nests. These characteristics can make African bees more dangerous for people to be around. If they disturb a hive, people are more likely to get stung by many bees at once.

Because of these characteristics, the scientists in Brazil were careful with the bees they brought from Africa. They kept the bees in a special hive so they could not get out and mix with the wild bees in Brazil. But one day, a worker accidentally let 26 bees out of the hive.

These African bees had offspring with the local bees. Some of the local bees became "Africanized." Over time, the Africanized population slowly began to spread to other places. They moved south into Argentina. They have also moved north. In 1990, they reached the United States. They were first discovered in Texas and have spread to Texas, Arizona, New Mexico, Louisiana, Florida, southern California, and Utah.

People are worried about the spread of Africanized bees. People who are attacked by Africanized bees most often have to be treated at a hospital. Several people have died from such attacks.

Beekeepers in the United States are trying to prevent the spread of Africanized bees. They continue to breed gentler bees and try to keep up the populations of European honey bees. These bees fill an ecological role in an ecosystem. If they were not present, the Africanized bees could more easily move into more areas. However, Africanized bees cannot survive very harsh winters and are not expected to move into the northern parts of the country.



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